we breakfasted with them in one of the most picturesque spots imaginable, and finally how we realised with difficulty that we were only four days' journey from London, while breakfasting, under a bower of carouba branches, off sheep roasted whole over hot ashes placed in holes in the earth, manipulated with hunting-knives and without forks, flat circular cakes of Kabyle bread serving us for plates, and gigantic wooden bowls of *kous-kous* as a second course.

The amicable attitude of these once savage aborigines seemed to us to re-echo the key-note of the Algiers meeting of the French Association; to proclaim loudly and with no uncertain sound that the "conquête pacifique de l'Afrique septentrionale par les Français" has indeed become an accomplished fact. G. F. RODWELL

ELECTRIC LIGHTING[1]

II.

THE second district of the City which has been illuminated by electricity is that embracing Blackfriars Bridge, upon which there are seven lamps; Bridge Street, in which there are four lamps, Ludgate Circus taking three lamps; Ludgate Hill four lamps; north side of St. Paul's six lamps; and Cheapside, as far as King Street, eight lamps; thirty-two lamps in all, replacing 150 gas lamps; and moreover, all these lamps are fixed upon one circuit, which is operated practically by only one machine, and that fixed more than a mile away, at the manufactory of the Brush Company in York Road, Lambeth. The total length of this circuit is over 20,000 feet. It consists of a copper cable made up of seven best copper wires surrounded with a thick layer of gutta-percha protected externally with tape that has been well tarred. This wire gives a total resistance of 7·5 ohms., and is protected by iron pipes like the Siemens method, and laid on the principle so well known in telegraphy. The dynamo-machine is of the familiar Brush form, and at present there are two machines of the size known as No. 7 cabled up in series, but forming practically only one machine. These two machines are intended to be replaced by one dynamo-machine, which, at a velocity of 800 revolutions, and worked by 32 indicated horse-power, will maintain forty lamps burning. The main feature of the Brush system is its simplicity, one machine working a number of lights, and those who visit the engine-room of Messrs. Siemens, and then that of the Brush Company, cannot help being struck by the immense difference in the contrast between the two. In Siemens' engine-room one feels in the midst of a whirling cotton manufactory; at the Brush works one sees nothing but a single engine working a single machine quietly and without fuss or flurry.

At present a Galloway engine is used by the Brush Company, but when the large 40-light dynamo-machine is set to work a Brotherhood 3-cylinder engine of 32-horse power will be used. These engines are admirably adapted for electric light purposes; they are bolted on to the same frame as the dynamo-machine, and give a compactness and solidity to the whole that is very striking.

The Brush lamps differ but very little from the generality of arc lamps. The carbons are maintained apart by what is known as a "sucking" coil; and the lamp possesses one or two very ingenious designs to shunt it out of circuit when anything fails and to shunt it in when all is in order. It is a kind of duplex lamp, supplied with a double set of carbons, each of which burns for eight hours, the total illuminating durability of the lamp being therefore sixteen hours. These lamps are fixed upon the ordinary lamp-posts, which have been raised 2½ feet higher than usual, so as to maintain the lamp 16 feet from the ground. They are surmounted by very ugly roofs that are neither covers nor reflectors, and the mode in which these lamp-posts have been utilised is the least commendable feature of this system. Indeed the Company might have made much more of their facilities. Compared with the tall posts in the remainder of Cheapside they make an unfavourable impression. The globes that embrace the light are too small, and the Company itself seems not to have arrived at the proper decision as to the best quality of globe to use, for in some places the lamps have clear globes, in others ground-glass, and in others opal globes, made, we believe, by Mr. Frederick Siemens of Dresden.

It cannot be said that the mode of illumination adopted by the Brush Company is perfect at present. The theory of the proper distribution of the light has been neglected. The lamps are scattered about in an irregular manner that is quite offensive to the eye, and though the effect of each lamp is certainly brilliant, the effect of the whole is rather displeasing. It is very wonderful that so much light should be produced from a point so far, and there is no doubt that the public mind has been captivated by the brilliancy of the lamps. The scientific eye however sees room for improvement, and it is hoped for the sake of the success of the experiment that the Brush Company will be guided by the experience of disinterested persons. The great merit of their system is the simplicity of the machinery employed, as well as the brilliancy of the light, but occasionally the lights are subject to great want of steadiness, and it is much feared, with the quality of the cable they have used and the enormous electromotive force, that the usual faults accompanying underground wires will develop themselves rather largely. In fact, two very serious breaks-down have already occurred, and they are about to replace their conductor by a better one. They will have to pay dearly for their neglect of common experience.

So far the experiment has shown that the practical lighting of streets by electricity is not only feasible but practicable. Moonlight has certainly been thrown into the shade, for the streets of the City are better illuminated by electricity than by fair Luna. It is quite possible to read a letter or to see one's watch at any point in King William Street. Indeed the smallest object can be seen anywhere, even in the middle of the road. Running-over has been rendered impossible.

The outside districts not specially favoured are clammering for electric lighting, but much has yet to be learnt before the experiment can be determined as final. For instance, we have the Lontin system to be tried, and we should certainly like to see that most energetic and successful engineer, Mr. Crompton, test his system in the London streets. Incandescent lamps are looking up and deserve a trial.

The best mode of distributing light has not yet been settled.

It would seem that a compromise between the centralised system of Siemens and the distributed system of the Brush Company is that needed to solve the problem of proper street illumination. But instead of carrying lamps irregularly down streets on hideous lamp-posts it would almost seem that the ancient defunct mode of swinging lamps across streets from housetops would be a better mode of illuminating streets. Take, for instance, Regent Street. If that street had suspended above it, at the height of 40 feet or 50 feet and at about every 100 yards, a Brush lamp fitted on the top of a graceful iron arch, or suspended on wire ropes between the tops of the houses, nothing could possibly be greater than the effect. Light arches thrown across the street might even be a convenient mode of suspending the wires forming the circuits, for overhead wires have a considerable advantage over underground wires in this, that they cool more rapidly and allow more electricity in consequence to pass through. More than that, they require no insulation, and the money thrown into their insulation could be thrown into their greater mass and greater strength. We illustrate this idea in Fig. 1. The City of London authorities who have shown so much energy and commendable zeal in carrying out this experiment would still further confer a favour on the public if they were to remove their hideous heraldric excrescence on the top of the so-called Temple Bar Memorial, and replace it by a handsome bronze pillar 30 feet or 40 feet high carrying a bright and brilliant electric light.

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[1] Continued from p. 7.

The Siemens system compares favourably with the Brush system in one respect, and that is they do not throw all their eggs into one basket. In their distributed system they have arranged the lamps on two circuits, so that each alternate lamp is on a different wire, and if anything goes wrong with the one circuit only alternative lamps go out, and not all. With the Brush system, on the contrary, if any fault occur in the wire in any of its length of nearly two miles, then every lamp on that circuit must go out.

The effect of fogs upon this system will be narrowly watched. It may happen, and probably will, that the fogs will be absolutely utilised by the electric light, for the reflection in the neighbourhood of the light by the small particles that constitute the fog throwing back the rays of light will help to illuminate the street, and so to a considerable extent relieve the impression now produced by dark fogs.

Of the efficiency of the system, as we have said, there can be no doubt. As to its economy, experience alone can determine. That the firms themselves require experience on this point is evident from the disparity in the charges made by the two firms competing. The Brush Company only estimate the cost of working their system at 660*l.*, which is the cost of gas: Siemens Brothers estimate the cost of working at 2270*l.*, nearly four times the cost of the Brush. We are inclined to think that a mean must be taken between these two. It is hopeless to expect that electric lighting in every case can be done at the cost of gas. Electric lighting is a luxury, and as a luxury we must expect to pay for it. Nevertheless it must not be forgotten that gas utilised as a motor can produce eleven times the quantity of light by the aid of electricity than it produces by direct combustion. This calculation is interesting. One hundred cubic feet of gas per hour can be made by combustion to produce 300 candle-power. The same quantity of gas used in a gas-engine to rotate a dynamo-machine will produce a light equal to 3750 candles, an illuminating power twelve times greater. Hence there must also be some cases in which the electric light can economically supplant gas; whether it can do so in the case of street-lighting remains to be seen by the great experiment now being tried.

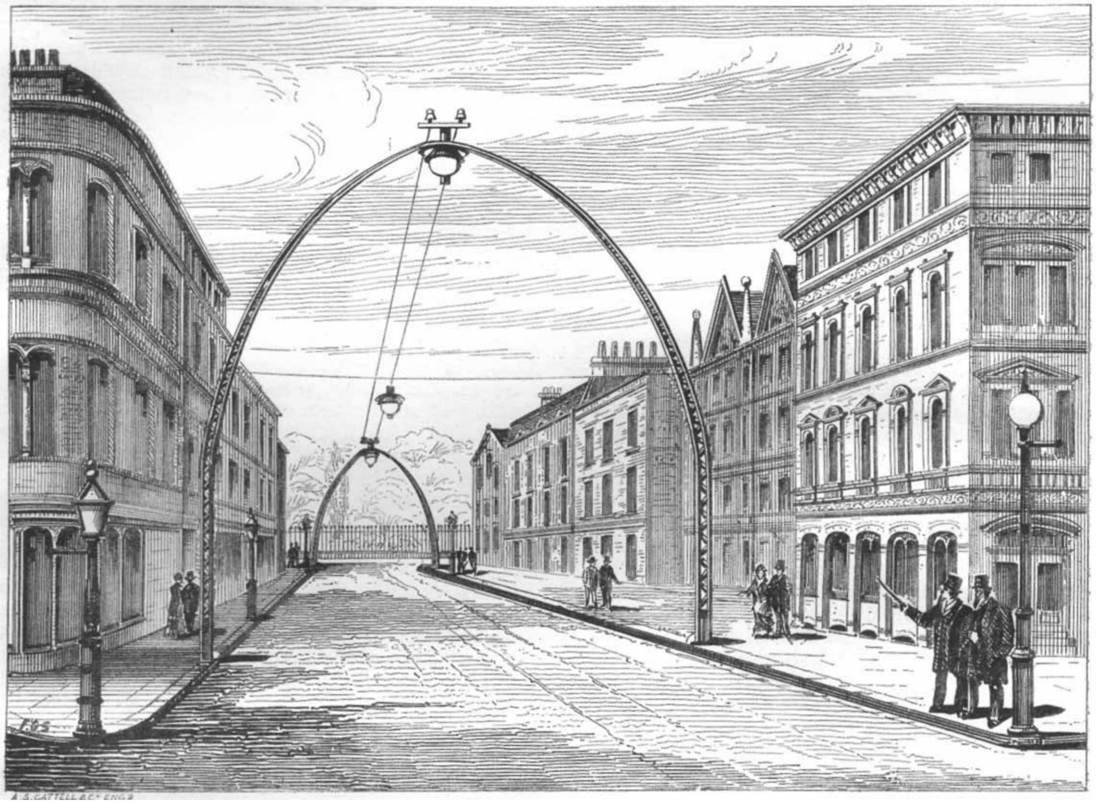
A. S. CATTELL & Co. ENG.

Fig. 1.

There are two or three very interesting points on the line of illumination where comparisons can be made between the different systems. For instance, from the middle of Blackfriars Bridge there is a good comparative test between the Brush and Jablochkoff systems; while at the corner of King Street there is an equally excellent opportunity to examine the merits of the Siemens distributed and the Brush systems. Photometric measurements at each place prove that the Brush Company's estimate of the light power of their lamps is absurdly exaggerated; 750 candles would be a very fair figure to give the lamp. The unhesitating opinion is that comparing each individual lamp, the Brush surpasses the others. In fact there is little difference between the smaller light of Siemens and the Jablochkoff, excepting this, that the Jablochkoff, by its variation and pinkish effects, irritates the eye considerably, although in bright weather the effect on the water is sparkling and brilliant. The Jablochkoff system has been entirely put in the shade by this interesting experiment. Though however we are obliged to express our opinion that the Brush lamp, *per se*, is the best, their system of illumination and distribution of posts cannot be compared with the care and skill evinced by the Messrs. Siemens. If either company were to try our suggestion, and illuminate down the centre of the street, maintaining the line of the street in their line of lights, we should have another interesting experiment that would go far to solve this question.

One last point deserves attention. It is the effect which these strong and powerful electric light currents have on the working of the telegraph. It was feared that their presence would deteriorate the working capacity of telegraph wires, and undoubtedly it would be so were it not that, taking advantage of the warnings given them, the electric light people have in all cases adopted a *return* wire, so as to make their circuit completely metallic throughout. We are glad to learn that this has proved quite effective except in one instance, where along London Bridge the return wire has been taken round the other side of the bridge, and here considerable disturbances have been experienced in certain telephone circuits from the contiguity of the electric light currents. No other disturbance has as yet been experienced.

We have also as yet to experience the effect of weather. Up to the present moment it has been all in favour of the electric light—bright, clear, cheerful skies have given to the light a clearness and brilliancy that have created for it a strong feeling. When thick weather and rain and fog occur there may be a change in this opinion, not only from a disturbance of the penetrating power of the light, but on the effect of rain and moisture on the wires conveying the currents.

(*To be continued.*)

DR. HOLUB'S AFRICAN TRAVELS[1]

I.

FROM his boyhood days Emil Holub determined he would explore some of the out-of-the-way portions of the African continent, and in 1872 the opportunity was presented to him of travelling in the southern parts of that great and still unexplored country. The result of seven years labour, during which period of time he made three several journeys of investigation, are now in these volumes laid before the public. In Dr. Holub's first journey he started from Port Elizabeth, crossing the Cape Colony district and the extreme south-west corner of the Orange Free State, to Kimberley. As far as Grahamstown he could have had the modern convenience of a train, but preferred a two-wheeled cart drawn by four small horses, making about eight miles an hour. The country is very charming for the greater part of this route, the road being beneath the brow of the Zuur Mountains, which with their wooded clefts and valleys, and their little lakes inclosed by sloping pastures, afforded many interesting views. The fauna was as varied as the flora, and numerous captures were made by the way. Even large game like elephants were to be met with, and the author records a sad accident which happened in the underwood by the Zondago River, between Port Elizabeth and Grahamstown. A black servant sent to look for some strayed cattle had been met by a herd of passing elephants, some of whom knocked him down and then trampled him to death. In this district these big animals are under the protection of the Government, and not being often interfered with, they would seem to have no great fear of man. The springbok (*Antelope euchore*) is noticed as still in some districts swarming, though its numbers must be rapidly diminishing, as Dr. Holub saw whole waggon-loads brought to Kimberley, where the carcases were sold at prices varying from three to seven shillings a head. Among other wonderful instances given of the great skill of the Dutch Boers in bringing down these swift creatures, he tells of one expert marksman killing by a single shot from his breech-loading rifle two of these antelopes.

Towards Colesberg the country forms a high tableland; it is on an affluent of the Orange River. On this table-land there was a herd of upwards of fifty quaggas, the only herd the author could hear of in South Africa. The farmers have lately spared them, so that during the last ten years they had increased to their present number from a small herd of fifteen. Philippolis, the first town entered of the Orange Free State, is described as dreary-looking, the houses mostly unoccupied, and the general aspect most melancholy. On the way to the Diamond Fields nothing but bad roads and worse weather were encountered; the wind was piercing, and snow actually fell. Fauresmith, one of the most considerable towns in the republic, although consisting of not more than eighty houses, covered a considerable area. It was clean and pleasant-looking, and here the author thought of settling for a time, and by the practice of his profession saving enough of money to enable him to start afresh for other fields; but the fates were against him, and he was, after a few days, obliged to push on to the Diamond Fields, and the following extract will best tell of these:—

"The first day upon which I set my eyes upon the Diamond Fields will ever be engraved on my memory. As our vehicle made its rapid descent from the heights near Scholze's Farm, and when my companion, pointing out to me the bare plains just ahead, told me that there lay my future home, my heart sank within me. A dull dense fog was all I could distinguish. A bitter wind rushing from the hills, and howling around us in the exposure of our open waggon, seemed to mock at the protection of our outside coats, and seemed resolved to make us know how ungenial the temperature of winter in South Africa could be; and the grey clouds that obscured the sky shadowed the entire landscape with an aspect of the deepest melancholy. Yes; here I was approaching the Eldorado of the thousands of all nations, attracted hither by the hope of rich reward; but the nearer I came the more my spirit failed me, and I was conscious of a sickening depression. Immediate contact with the fog that had been observed from the distant heights at once revealed its true origin and character. It proved to be dense clouds of dust first raised by the west wind from the orange-coloured sand on the plains, and then mingled with the loose particles of calciferous earth piled up in heaps amidst the huts on the diggings. So completely did it fill the atmosphere that it would require little stretch of imagination to fancy that it was a sand-storm of the Sahara. As we entered the encampment the blinding dust was so thick that we could only see a few yards before us; we were obliged to proceed very cautiously, and before we reached the office of the friend I had to call on, another mile or so farther on, our faces and our clothes were literally incrusted. We only shared the fate of all new-comers in feeling not only distressed but really ill; the very horses sneezed and snorted, and showed that the condition of things was no less painful to them than to their masters. Here and there on both sides, right and left, wherever the gloom would permit me to see, I noticed round and oblong tents and huts intended for shops, but now closed, built of corrugated iron. Under the fury of the wind the tent-poles bent, and the ropes were subjected to so great a strain that the erections threatened every moment to collapse. Many and many a sheet of the galvanised iron got loose from the roofs or sides of the huts, and creaking in melancholy discord, contributed as it were to the gloominess of

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[1] "Seven Years in South Africa. Travels, Researches, and Hunting Adventures between the Diamond Fields and the Zambesi." By Dr. Emil Holub (translated by Ellen E. Frewer). With about 200 original illustrations and a map. In two volumes. (London: Sampson Low, Marston, Searle, and Rivington, 1881.)